

Redescription of *Atys macandrewii* E. A. Smith, 1872, an amphiatlantic cephalaspidean

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Abstract: *Atys macandrewii* E. A. Smith, 1872 (Gastropoda: Cephalaspidea: Haminoeidae), originally described from the Canary Islands, is redescribed from specimens collected in Cape Verde and in the Canary Islands, in comparison with the type material. Living coloration is described, and the radula, jaws, and gizzard plates are studied by scanning electron microscopy. Synonymy between Smith's species and the western Atlantic *A. lineata* Usticke, 1959, as previously suggested by Marcus (1970), is confirmed here through study of their respective type material.

Key words: Cephalaspidea, Haminoeidae, *Atys macandrewii*, redescription, Atlantic waters

The genus *Atys* Montfort, 1810, is characterized, according to Pilsbry (1895), by an involute, globose-oval to subcylindrical-oval shell, with the spire concealed and a short columella. The aperture is as long as the shell and produced above the vertex, with the lip rising from the center of the vertex.

Atys macandrewii (originally *M'andrewii*) was described by Smith (1872) from the Canary Islands on the basis of empty shells collected by R. M'Andrew at Lanzarote. Smith's original description was brief and referred only to the shell, "at once recognized by the numerous lacteous bands upon a pellucid ground."

Since its original description, *Atys macandrewii* has been mentioned in the literature only in a few works. Odhner (1932), Nordsieck (1972), and Nordsieck and García-Talavera (1979) repeated the record from Canarian waters, and the species is also known from Madeira (Nordsieck, 1972; Burn, 1978), Selvagens (Talavera, 1978), and the Azores (Nordsieck and García-Talavera, 1979; Mikkelsen, 1995); thus present material constitutes the first record from the Cape Verdes.

Marcus (1970) considered this species as the senior synonym of the western Atlantic *Atys lineata* Usticke, 1959 (originally described from the Virgin Islands), and recorded it from Brazil, pointing out its amphiatlantic distribution and providing a quite complete description of the shell, gizzard plates, and penis. Here, examination of specimens collected in the Cape Verde archipelago and in the Canary Islands, and comparison with the type material (in The Natural History Museum, London), allow redescription of the species. An external description of living speci-

mens is given for the first time, and the radula, jaws, and gizzard plates are studied by scanning electron microscopy.

MATERIAL AND METHODS

The specimens studied in this paper were collected during scientific expeditions or provided by the following institutions: AMNH, American Museum of Natural History, New York; MNCN, Museo Nacional de Ciencias Naturales, Madrid; NHM, The Natural History Museum, London.

Description of living Cape Verde specimens is interpreted from original notes and drawings made by the collectors. Preserved specimens were dissected and hard parts of the digestive system were studied by scanning electron microscopy.

SYSTEMATIC SECTION

Genus *Atys* Montfort, 1810

Type species *Bulla naucum* Linné, 1758

Atys macandrewii E. A. Smith, 1872

Atys M'Andrewii E. A. Smith, 1872: 346.

Atys lineata Usticke, 1959: 85, pl. IV, fig. 15.

Atys (Alicula) macandrewi Smith. Odhner, 1932: 24, pl. I, fig. 20.

Material examined

Alys macandrewii syntypes: 9 empty shells from the Canary Islands (Lanzarote), 1.79-4.46 mm length, NHM 1855.4.4.282.

Material from Sal Island, Cape Verde: Palmeira, 11 specimens, 3.65-5.27 mm length; Fontona, 7 specimens, 3.67-4.96 mm length. All were dried specimens that were rehydrated using 5% trisodium phosphate. All were collected by dredging in shallow waters during the First Iberian Expedition to Cape Verde, August 1985; voucher specimens are available as MNCN 15.05/21436 and 15.05/21437.

Material from Tenerife, Canary Islands: 4 specimens, 5.53-6.70 mm length, collected by dredge in shallow waters, February 1996.

Alys lineata: one paratype (empty shell), 5.46 mm length, from Ham Bay, St. Croix, Virgin Islands, AMNH 270411 (Louis and Lorraine Schwartz, donors); 17 empty shells, 2.72-5.58 mm length, from the type locality, AMNH 193881 (Gordon Nowell-Usticke coll.); 3 empty shells, from Charlotteville Bay, New Providence, Bahamas, 4.15, 5.17, and 5.22 mm, AMNH 277638.

Original description

Smith's original description of *Alys macandrewii* was translated by Pilsbry (1895: 273) as follows: "shell elongate-ovate, truncated above, pellucid, encircled by numerous narrow milky bands, one in the middle wider; transversely distantly striated at top and base, the interstice smooth; vertex excavated, bounded by an acute margin. Aperture narrow, produced a little above the vertex, a little dilated and effuse at the base; lip thin, inserted in the middle of the vertex and sinuated there; columella short, thickened, hardly twisted; umbilical region slightly perforated." According to Pilsbry, this species was easy to distinguish by "the numerous lacteous bands upon a pellucid ground" on the shell.

Redescription

The type material of *Alys macandrewii* consists of nine empty shells, two of them still glued to a piece of black paper (Figs. 1A-C). Although there is no locality designated on the label of this material, it is Lanzarote (Lancerote) according to the original description. All of the type specimens have transverse white bands, and some very clearly show this species-specific character, *e. g.* the smallest one (Fig. 1C) and also a larger specimen (Fig. 1A).

In all of the specimens we have examined, the involute shell is oval and elongate, with a narrow aperture, transparent, and provided with opaque white spiral bands (Figs. 1, 2). The opaque white bands are always present,

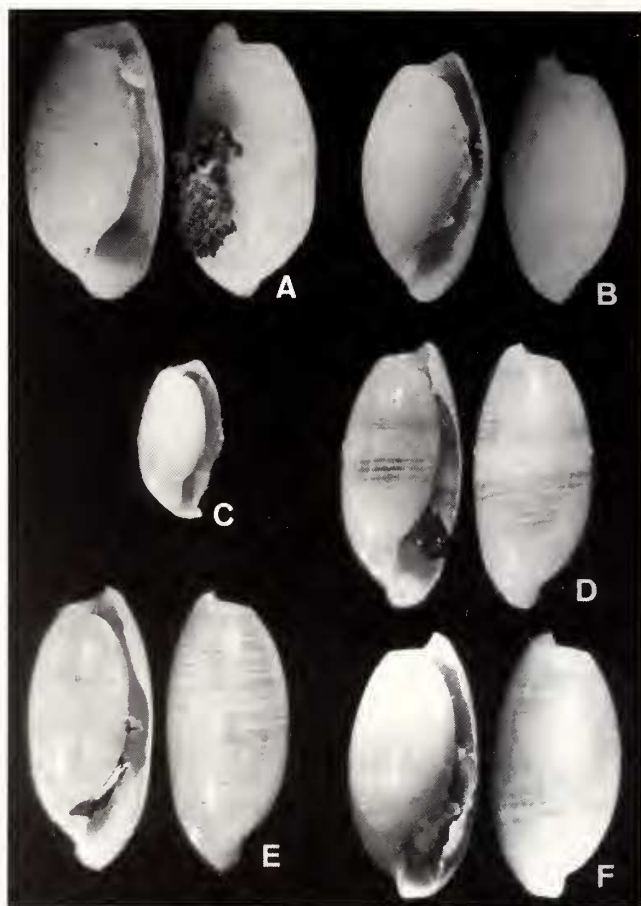


Fig. 1. *Alys macandrewii*. A. Syntype, NHM 1855.4.4.282 (3.44 x 1.58 mm). B. Syntype, NHM 1855.4.4.282 (4.46 x 2.16 mm). C. Syntype, NHM 1855.4.4.282 (1.79 x 0.99 mm). D. Shell from Fontona, Cape Verde (4.72 x 2.12 mm). E. Shell from Palmeira, Cape Verde (4.61 x 2.04 mm). F. Shell from Tenerife, Canary Islands (5.53 x 2.69 mm).

but their density varies among specimens. Usually there is a broad band in the middle and narrow ones toward the ends, although some specimens show several fine white bands in the central area instead of a single broad one (Fig. 1E); another specimen has opaque white bands on the shell, but not disposed in the middle (Fig. 1F).

The shells are also sculptured with spiral grooves on their anterior and posterior thirds (usually 7-10 grooves in the posterior part and 10-12 anteriorly), whereas the central area is smooth (Fig. 3B). The range of variation of the shell length and width is recorded in Table 1.

In living specimens of *Alys macandrewii*, the ground color of the body is pellucid white with irregular dots and spots of white opaque pigment. The cephalic shield is large, bilobed at its posterior end, and disposed over the anterior part of the shell (Fig. 3A). The parapodial lobes are short, not meeting mid-dorsally.

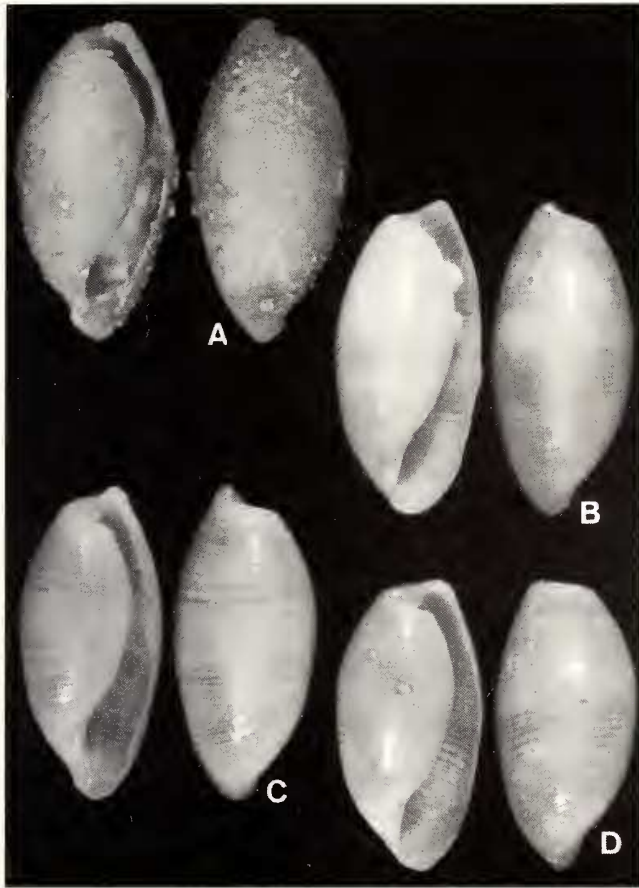


Fig. 2. *Atya lineata* (= *A. macandrewii*). A. Paratype, AMNH 270411 (5.46 x 2.71 mm). B. Shell from the type locality, AMNH 193881 (5.58 x 2.49 mm). C. Shell from the type locality, AMNH 193881 (3.63 x 1.62 mm). D. Shell from the Bahamas, AMNH 277638 (5.22 x 2.52 mm).

In four examined radulae, the formula was 7.1.7 (Fig. 4A), with 19-21 rows. The rachidian tooth is wide and low, with a cusp centrally notched and divided in two lobes, each bearing 12-15 sharply pointed denticles (Fig. 4B). The first lateral teeth are broad at their bases, with a single long cusp bearing a few external denticles (Figs. 4C-D). Toward the margins the teeth become shorter and smaller, and they are provided with more numerous external denticles (Figs. 4E-F).

Jaw rodlets (Figs. 4G-H) are short (less than 10 μ m), wide, and flattened toward their free edge, bearing 17-20 finger-shaped denticles.

The three oval gizzard plates are equal in size, each with about 20 transverse folds, each of these showing a single row of spiny cones (Figs. 5A-D). Marcus (1970: 936) described the gizzard plates of one Brazilian specimen as measuring 590 by 290 μ m, and "provided with 25 crests with a single row of spines."

Comments on *Atya lineata*

The examined material of *Atya lineata* consists of empty shells (Fig. 2), with general morphology identical to that described for *A. macandrewii*. The specimen designated by Usticke as paratype and examined here (Fig. 2A) is a badly eroded shell, in which the opaque white spiral bands are not visible.

The original description of *Atya lineata* given by Usticke (1959: 85) is brief and only refers to the shell, as follows: "The white background bears many colorless spiral lines, which appear quite dark on a white background... These spirals seem to be grouped together, usually having a plain space in the middle." It must be pointed out that Usticke saw clear lines on a white shell, while Smith (1872) described white bands on a clear shell.

Usticke's original description also stated that the shell of *Atya lineata* lacks the incised spiral lines found in other *Atya* species, such as *A. sharpi* Vanatta, 1901; this was repeated by Warmke and Abbott (1961: 143). Nevertheless, in the shells from the type locality examined here (Figs. 2B-C), the spiral lines are well-developed and clearly visible.

DISCUSSION

The original description of *Atya macandrewii* referred only to shell morphology, and soft parts of the

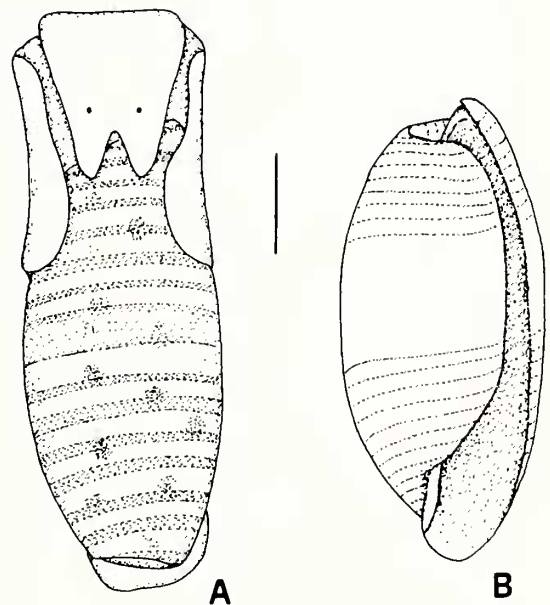


Fig. 3. *Atya macandrewii*. A. Dorsal view of a living specimen. B. Drawing of the shell showing the location of spiral grooves. Scale bar = 1 mm.

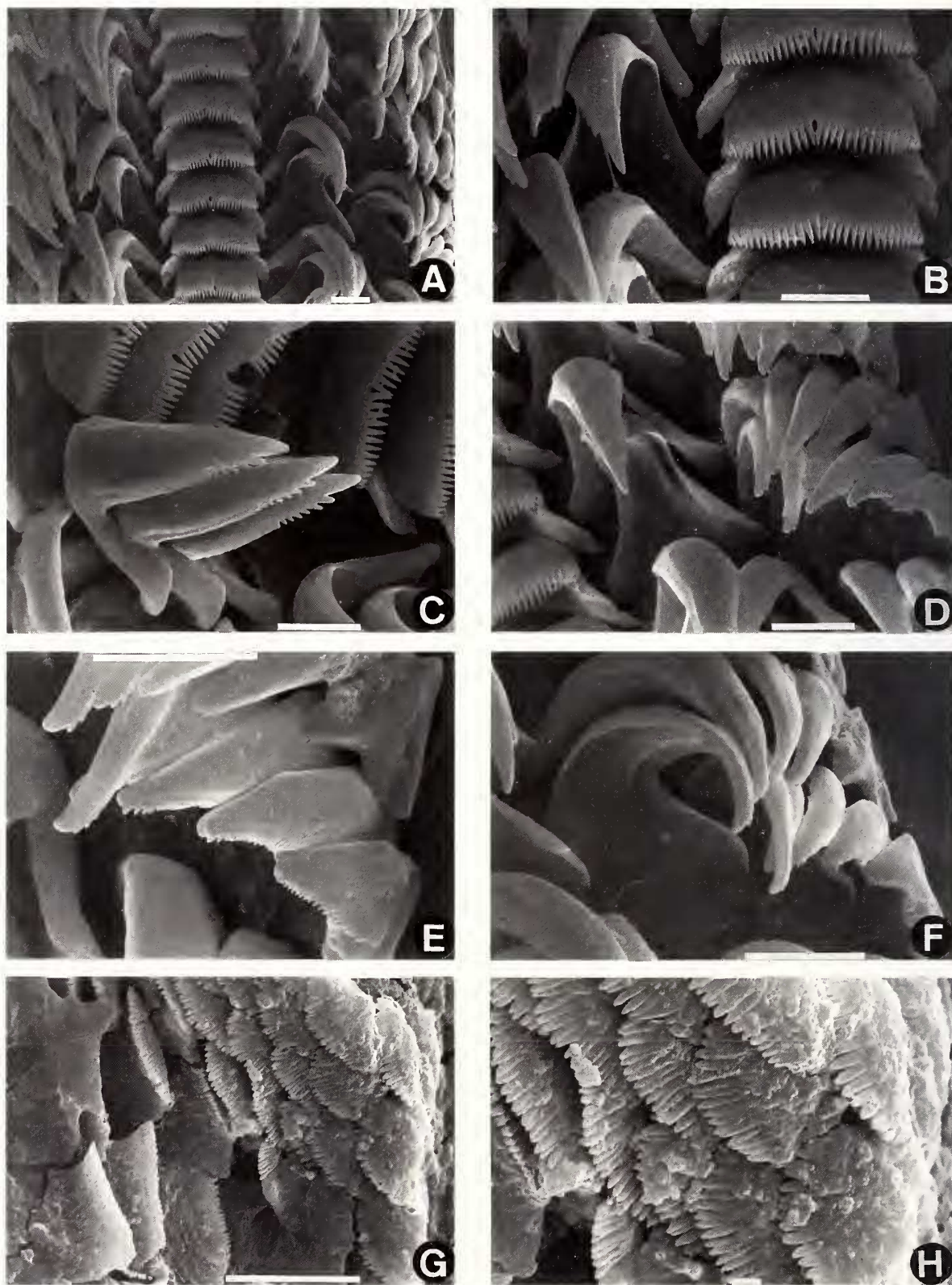
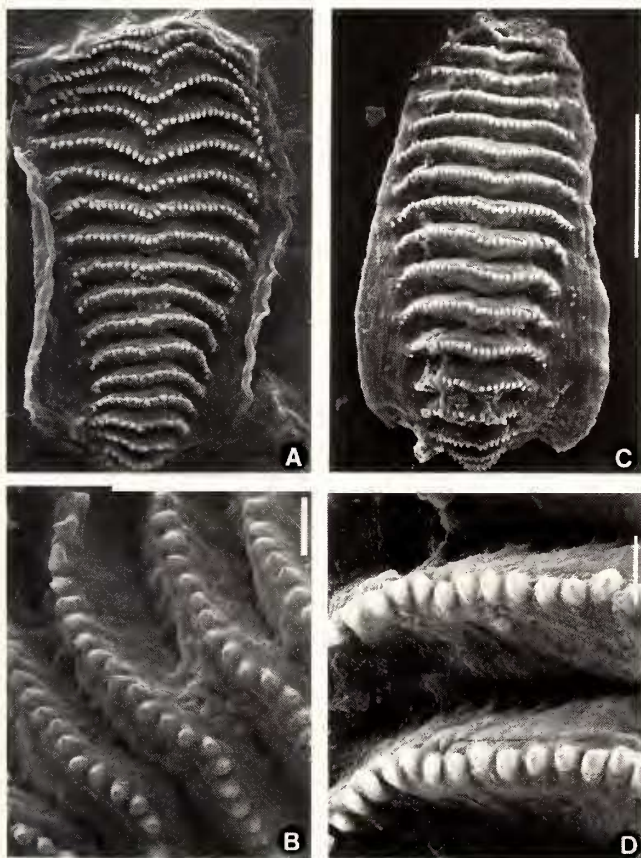


Fig. 4. *Alys macandrewii*, Palmeira, Cape Verde, radulae and jaws. A. General view of the radula. B. Rachidian tooth. C. First lateral tooth. D. Lateral teeth. E. Lateral teeth toward the margin. F. Outer lateral teeth. G. Jaw elements. H. Detail of jaw elements. Scale bars = 10 μ m (A-G), 1 μ m (H).

Table 1. Range of variation of shell length (L) and width (W) (in mm) in *Alys macandrewii* from several localities (* material labelled as *A. lineata*).

Locality	N	Shell Dimensions	W/L Ratio	Source
Brazil	—	5.20 x 2.80 to 7.30 x 3.60	0.49 to 0.54	Marcus, 1970
Virgin Islands *	18	2.72 x 1.28 to 5.58 x 2.49	0.45 to 0.47	AMNH 270411 and 193881
Bahamas *	3	4.15 x 1.90 to 5.22 x 2.52	0.46 to 0.48	AMNH 277638
Canary Islands (type material)	9	1.79 x 0.99 to 4.46 x 2.16	0.49 to 0.55	NHM 1855.4.4.282
Canary Islands (Tenerife)	4	5.53 x 2.69 to 6.70 x 3.24	0.48 to 0.49	present study
Cape Verde	18	3.65 x 1.67 to 5.27 x 2.37	0.45 to 0.46	present study

**Fig. 5.** *Alys macandrewii*, gizzard plates. **A.** From specimen from Palmeira, Cape Verde, general view. **B.** Same as **A.**, detail. **C.** From specimen from Tenerife, Canary Islands. **D.** Same as **C.**, detail. Scale bars = 10 µm (**A**, **B**, **D**), 100 µm (**C**).

body were not taken into account. We attribute our specimens from Cape Verde and from Tenerife to Smith's species on the basis of their shells, provided with several clearly visible transverse white bands, a character not pre-

sent in any other species of the genus.

In a Brazilian specimen, Marcus (1970: 936) described the partly evaginated male organ as "... a muscular papilla and entally a bipartite duct, opening into two vesicles, the shorter of which has a glandular epithelium and corresponds to the caecum; the longer stores sperm." Unfortunately, we were unable to verify the penial morphology in dried specimens from the Cape Verde Islands.

As previously mentioned, Marcus (1970) recorded *Alys macandrewii* from Brazil, considering this species as a senior synonym of *A. lineata*, with type locality in the Virgin Islands, and also recorded from the Caribbean Sea and Curaçao. According to Marcus, the transverse white bands of the shell make *A. macandrewii* "an unquestionable species." In fact, shell morphology of the specimens of *A. lineata* examined here is identical to that of our eastern Atlantic specimens.

Comparison of the type material of *Alys macandrewii* and *A. lineata*, and other shells from both Atlantic shores allows us to confirm their synonymy and reaffirm the amphiatlantic character of this species. The presence of wide and well-defined white transverse bands in the shell is a character not present in other Atlantic and Mediterranean species of this genus, such as *A. diaphana* (Aradas, 1840), *A. caribaea* (Orbigny, 1841), *A. blainvilliana* (Récluz, 1843), *A. brocchii* (Michelotti, 1847), *A. jeffreysi* (Weinkauff, 1866), *A. guildingi* Sowerby, 1869, *A. canariensis* Smith, 1872, *A. riiseana* Mörch, 1875, *A. sandersoni* Dall, 1881, *A. sharpi*, *A. cylindricella* Usticke, 1971, and *A. globulinus* Nordsieck, 1972.

Although Abbott (1974: 320) considered *Alys lineata* as a synonym of *A. caribaea*, the latter is clearly a different species, its shell uniformly white in color and showing close spiral lines at both ends. All species included in the genus *Alys* have been described mainly on the

basis of shell morphology, whereas soft parts have been poorly studied. The systematic status of many of these species requires careful review, as does the amphiatlantic character of some of them.

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